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A Modified Feeding Regimen to Enhance The Reproductive Performance of Broiler Breeder Hens

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ABSTRACT

Two groups of a broiler breeder batch were subjected to 5/7 day feeding regimens during rearing. Following the photostimulation, one group (House A) was changed into daily feeding at their first egg according to the conventional manner. The other group (House B) was changed into daily feeding at 23% hen day production. Both groups reached peak feed allowance of 150g/bird/day at 60% hen day production which was continued until both passed their peak production period.

The weekly hen-day production was greater (P< 0.05) in House B from 25th to 39th week except in the 38th week. The hatching egg production also showed similar results, i.e. 162.3 and 172.3 eggs/ hen housed in House A and B respectively(P< 0.05). However, House B had consumed 367g/bird more feed compared to House A. Although the birds consumed more feed in House B, these results suggest that the novel feeding regimen applied is economical compared to conventional feeding regimen.

KEYWORDS broiler breeder, daily feeding, egg production

Introduction

Since there is a negative correlation between growth rate and reproduction, allowing the broiler breeder hens to exhibit their full genetic growth potential is uneconomical (Leeson & Summers, 2000).Feed restriction during rearing and reproduction phases increase the reproductive efficiency of them since it delays sexual maturity (Robbins, McGhee, Osei & Beauchene, 1986; Yu, Robinson, Charles & Weingardt,1992; Heck, Onagbesan, Tona, Metayer, Putterflam, Jego, Trevidy, Decuypere, Williams, Picard, & Bruggeman, 2004; Bruggeman,Onagbesan, Ragot, Metayer, Cassy, Favreau, Jego, Trevidy, Tona, Williams, Decuypere, & Picard, 2005; Hocking & Robertson, 2005; Onagbesan, Metayer, Tona, Williams, Decuypere & Bruggeman, 2006) and decreases mortality (Katanbaf, Dunnington & Siegel, 1989a).Feed restricted broiler breeder hens have produced more eggs(Yu et al., 1992; Heck et al., 2004; Bruggeman et al., 2005; Onagbesan et al., 2006)largely due to long clutch length(Robinson, Robinson & Scott, 1991). Feed restriction during rearing and production periods help to reduce the unusual development of large number of follicles in the ovary (Hocking, Gilbert, Walker & Waddington, 1987; Hocking, Waddington, Walker & Gilbert, 1989). Broiler breeders lay more defective eggs compared to layers(Yu et al., 1992) and if they arefed ad-libitum, they ovulate more than one follicle per day leading to disrupted egg formation due to reduced efficiency of energy and amino acid utilization(Katanbaf, Dunnington & Siegel,1989b).

Physical feed restriction is the popularly used management toolin order to control over growth of broiler breeders.Since growing birds finish their feed within a very short time it is advisable to adopt either skip-a-day feeding or its alternatives such as four days of feeding(4/7), five days of feeding (5/7) or six days of feeding (6/7) per week.(“Hubbard F15”,2006; “Cobb”, 2008).

Feed should not be withdrawn when birds are at ≥80% production because around this time, the egg size keeps increasing. In most flocks, peak nutrient needs for eggs are reached at the time the production has declined to 79-80%. Around this time, gradual withdrawal of feed can be introduced. With a low and steady removal of feed, it is possible to prevent obesity in hens too(Leeson& Summers, 2000).

Objectives

The work herein examined whether shifting into “daily feeding” after photostimulation from the feeding regimen of rearing according to a novel and modified strategy could improve the subsequent egg production.

Materials and Methods

In a large scale commercial broiler breeder farmunder usual conditions,a batch of 21 weeks old Hubbard F15 broiler breeders was used for the study.

Management during Rearing of all birds

All birds, since they were one day old, until 21 weeks of age were reared in two adjacent houses (House A and B).At the beginning each house had 10,400 of day-old chicks in four separate pens. All birds were fed a commercially available standard corn- soy starter diet ad-libitum from 0 to 1 week of age, and then a developer diet from 1 to 19 weeks of age followed by a pre- breeder diet until the first egg was layed. From 1 to 4 weeks of age, the birds were on a restricted daily feeding schedule. From 4thweek,until their first egg, all birds were on 5/7 day restricted feeding distributed via automatic chain feeders. At 4th week, birds in each House were divided into five pens according to their body weights for easy feeding.Once a week, a 5% sample from each pen was selected haphazardly for weighing and results of which were used to determine feed allocations according to the guidelines of the primary breeder.

Management during Breeding

At 21 weeks of age, all five pens in each House were combined. The house A and B at this point had 9,855 and 9,985 pullets respectively. The birds then were exposed to a photoperiod of 12h with 60-100 Lux intensity after which the time was increased by one hour per week to reach the maximum of 17h which was maintained until the study was over. Roosters were also introduced at 21 weeks of age and they were fed with an automated pan feeder line which was elevated in height to prevent the access of hens.At the age of first egg, the hens were changed into a commercial broiler breeder laying diet. Feeding was done early morning (0430h) from the first egg until the end of the study.At the First egg, the birds in House A were assigned on daily feeding while those in House B were continued on 5/7 day feeding. Until 5% hen day production, the feeding was done according to bodyweight targets.

House A
Lead Feeding was started at 5%hen day production and daily feed increments were allocated according to the estimated rise in production. Feed increments were designed to reach the peak feed allowance of 150g/day at 60% hen day production based on the primary breeder guidelines. Feed increments (FI) were calculated for every 10% rise in hen day production using the following formula.

$$\mathrm{FI} = \frac{Peak\ Feed - Feed\ at\ the\ initiation\ of\ lead\ feeding}{60 - \%\ Hen\ day\ production\ at\ the\ initiation\ of\ lead\ feeding} \times 10$$

The lead feeding program developed is given in Table 1.

Table1. Lead feeding programme of the hens in House A

Production %	5- 15	15- 25	25- 35	35- 45	45- 55	55- 60
Feed (g)/ bird	113	121	129	137	145	150

House B
The birds in House B were continued on 5/7 day feeding even after the first egg and feed increments were given based on weekly bodyweight targets. Up to 161 days 5/7 feeding was continued and then up to 10% hen day production, 6/7 day feeding was adopted. The goal was to switch the 6/7 day feeding to daily feeding at approximately 10% hen day production. Because of the rapid increase in egg production, it was switched into daily feeding at 23% hen day production. The amount of 6/7 day feed was given on the particular non-feed day as the daily feed and the hen day production of that day was considered as the initial point to develop the lead feeding programme. Daily feed increments were calculated according to the estimated rise in hen day production using the same equation as in House A. The lead feeding programmedeveloped is given in Table 2.

Table2. Lead feeding programme of the hens in House B

Production %	23- 33	33- 43	43- 53	53- 60
Feed (g)/ bird	129	137	145	150

Houses A and B
Hens in both houses, A and B were fed according to the developed lead feeding schedules to reach peak feed allowance of 150g at 60 % hen day production. That was continued until the production reached 80% and throughout the period where it maintained 80% or above. Feed withdrawal was started when the weekly average production dropped below 80%.One gram of feed per week was withdrawn when there is a 1% or more drop in production, without stall out or drops in bodyweight.

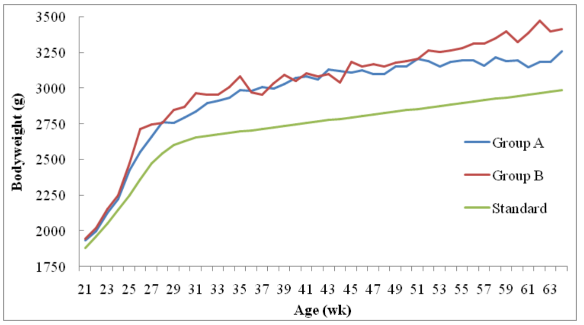
Eggs that were heavier than 45g and single-yolked without any shell aberrations were considered as normal (hatching) while all other eggs were excluded from the study. Necropsies were performed on all hens died after 23week of age and recorded.

Statistical Analyses
Data analysis was done with "MINITAB 17" statistical software (Minitab Inc.,State College, Pennsylvania, USA). Pooled t-test at 5% significance was used to detect differences between two groups on weekly bodyweight and egg production.

Results
At the end of the 24th week, a total of 9,799 and 9,965 birds were in House A and B respectively which was considered as the number of birds housed for production.

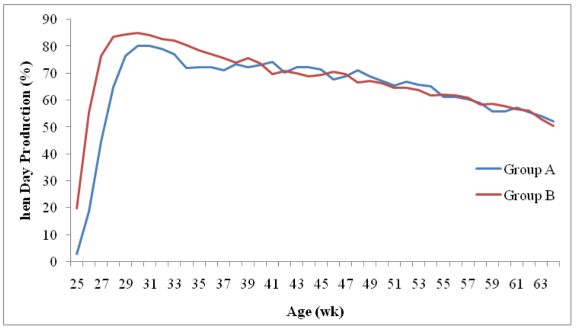
Bodyweight gain of birds after 21 weeks of age is depicted in Figure 1. The birds in House A had significantly lower bodyweights compared to those in House B on 26, 27, 29, 31 and 35 weeks. After week 53 until the end of the study, the birds in House B had higher bodyweight compared to those in House A. The birds in both houses had elevated bodyweights compared to the standard given by the breeder.

Figure1. Weekly average bodyweights through 64 weeks of age for both test groups A and B with standards.



The hens in House A started laying 4 days later compared to hens in House B. The hens in House B in addition, reached 10% hen day egg production 7 days earlier compared to those in House A after photostimulation. Weekly hen day egg production was significantly greater for the hens in House B from 25th to 37th week (Figure 2) and in 39th week and that of birds in House A was significant in few weeks after 40 weeks of age.

Figure2. Weekly hen- day egg production through 64 weeks of age for both test groups

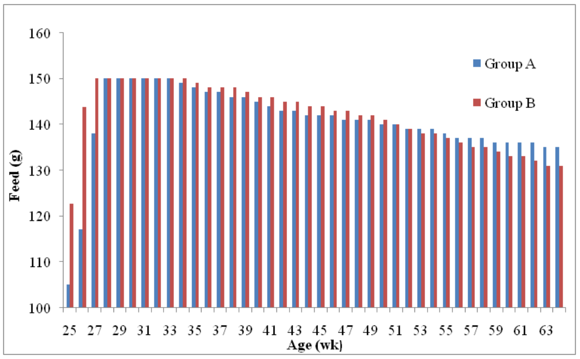


The birds in House B reached 84.8% peak of average hen day production at 30 weeks of age, while those in House A reached their peak one week later and it was 80.2%. For the entire production period, the overall percentage of hen day egg production was greater (67.5% vs. 64.2%) for the birds in House B compared to House A. Through 64 weeks of age, the total eggs per hen housed production were also greater (180 vs. 171.5) for the hens in House B compared to hens in House A.

The percentage of hatching eggs from House A was slightly lower compared to House B (94.6% vs. 95.7% respectively). Hen housed hatching egg production through 64 weeks of age was 162.3 and 172.3 eggs/hen for hens in House A and B respectively. The hatch of fertile eggs was also higher in eggs of hens in House B compared to those in House A.

The birds in House B reached the peak feed allowance of 150g/bird/day, ten days earlier compared to those in House A. A hen in House A has thus consumed 367g less feed compared to a hen in House B during the entire study period (Figure 3).

Figure3. Weekly feed allocation through 64 weeks of age for both test groups.



Cumulative mortality of the hens through 64 weeks of age was 7.3% and 8.9% for birds in House A and B respectively. High mortalities were observed in both houses during early laying period. Postmortems did not reveal any pathological condition in all mortalities.

Discussion

According to Hocking (2004) the higher bodyweight of hens of House B could be the reason for their early beginning and rapid increase of production followed by an early peak when compared to House A.Early sexual maturity in hens in House B could be attributed to the unique feeding regimen applied. This is particularly so because, the day length (Morris, 1967), the growth rate prior to the attainment of sexual maturity (Gous & Cherry, 2005) and bodyweight and age at photostimulation(Yuan, Lien & McDaniel, 1994)were similar in both groups.

Though plasma progesterone appears to be high when hens are fed daily after photostimulation (Gibson, Wilson & Davis, 2008), there was no evidence to state that the present feeding regimen had altered that situation. In addition, there was also no evidence for multiple ovulations due to novel feeding regimen, which is in agreement with findings of Gous and Cherry (2004). A possible high embryonic mortality in House A due to more first sequence eggs in shorter clutch length (Robinson, Hardin, Robinson & Williams, 1991) may be the reason for observed higher hatch of fertile eggs in House B.

The cumulative mortality in the study was lower than the accepted level of 10% by the primary breeder ("Hubbard F15", 2006)in both groups. The observed high mortality during 26-28 weeks was due to uterine prolapsed and smothering of hens at ovipositioning since they were new to egg laying.

Hens in both Houses had higher body weights compared to the standards of primary breeder through 64 weeks of age. The Hubbard F15 is a dwarf breed and therefore, the body-weight standards are significantly lower than that of heavy type breeders.However, according to these results revising-standards of the primary breeder may also be warranted.

The present study design and only two observational groups without replicates, restrict our extrapolations.However, those were the natural production situations within which this study could be carried out.The flocks which were subsequent to this study were managed according to the "modified" feeding regimen (as in House B) since it provided good results.

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